Anaphylaxis

Resuscitation Council UK

Learning outcomes

This session should enable you to:

- recognise anaphylaxis
- identify common causes of anaphylaxis
- treat anaphylaxis by following the anaphylaxis algorithm
- describe refractory anaphylaxis
- understand follow up and an ongoing care of patients with anaphylaxis

Recognising anaphylaxis

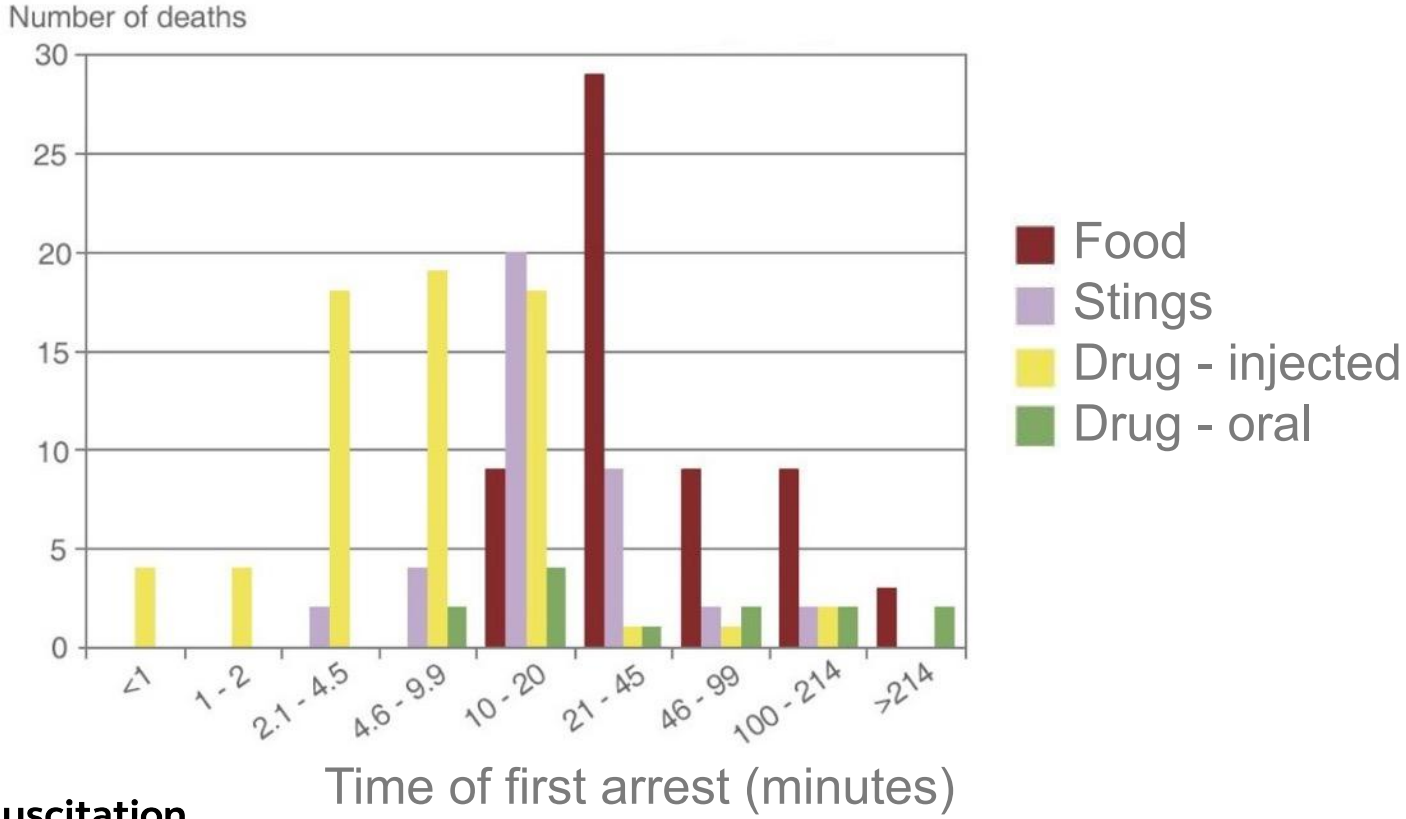
- sudden onset and rapid progression of symptoms
- **A**irway and/or **B**reathing and/or **C**irculation problems
- skin and/or mucosal changes (flushing, urticaria, angioedema)
  - but these may be absent in up to 20% of cases
- the diagnosis is supported if the person has been exposed to an allergen known to affect them

Common causes of anaphylaxis

	Anaphylaxis (all severities)	Fatal anaphylaxis
Foods	**Commonest triggers:** Peanuts Tree nuts Cow's milk (children)	**Commonest triggers:** Peanut or tree nuts Cow's milk
Medication	**Commonest triggers are:** Antibiotics Chemotherapy drugs **Commonest triggers in peri-operative setting:** Antibiotics Neuromuscular blocking agents (NMBAs) Chlorhexidine	**Commonest triggers:** NMBAs Antibiotics Contrast media Non-steroidal anti-inflammatory drugs
Insect stings	6.5% of hospital admissions coded as anaphylaxis	14% of anaphylaxis-related deaths

Resuscitation Council UK

Time course for fatal anaphylaxis



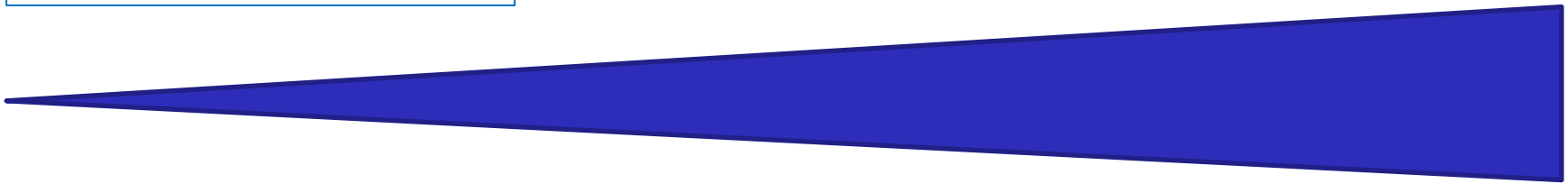
Resuscitation Council UK

Spectrum of severity

Mild, localized skin symptoms and/or swelling of lips/face

Generalized skin reactions

Airway/**B**reathing/**C**irculation problems ± skin symptoms



No **A**irway/**B**reathing/**C**irculation problems: **Not Anaphylaxis**

A/**B**/**C** problems: **ANAPHYLAXIS**

SEVERE ANAPHYLAXIS

Resuscitation Council UK

Resuscitation Council UK

GUIDELINES 2021

Anaphylaxis

Anaphylaxis?

A = Airway B = Breathing C = Circulation D = Disability E = Exposure

Diagnosis – look for:

- Sudden onset of Airway and/or Breathing and/or Circulation problems[1]
- And usually skin changes (e.g. itchy rash)

Call for HELP
Call resuscitation team or ambulance

- Remove trigger if possible (e.g. stop any infusion)
- Lie patient flat (with or without legs elevated)
  - A sitting position may make breathing easier
  - If pregnant, lie on left side

Give intramuscular (IM) adrenaline[2]

Inject at **anterolateral aspect** – middle third of the thigh

- Establish airway
- Give high flow oxygen
- Apply monitoring: pulse oximetry, ECG, blood pressure

If no response:

- Repeat IM adrenaline after 5 minutes
- IV fluid bolus[3]

If no improvement in Breathing or Circulation problems[1] despite TWO doses of IM adrenaline:

- Confirm resuscitation team or ambulance has been called
- Follow REFRACTORY ANAPHYLAXIS ALGORITHM

1. Life-threatening problems

Airway
Hoarse voice, stridor

Breathing
↑work of breathing, wheeze, fatigue, cyanosis, SpO_2 <94%

Circulation
Low blood pressure, signs of shock, confusion, reduced consciousness

2. Intramuscular (IM) adrenaline
Use adrenaline at 1 mg/mL (1:1000) concentration

Adult and child >12 years:	500 micrograms IM (0.5 mL)
Child 6–12 years:	300 micrograms IM (0.3 mL)
Child 6 months to 6 years:	150 micrograms IM (0.15 mL)
Child <6 months:	100–150 micrograms IM (0.1–0.15 mL)

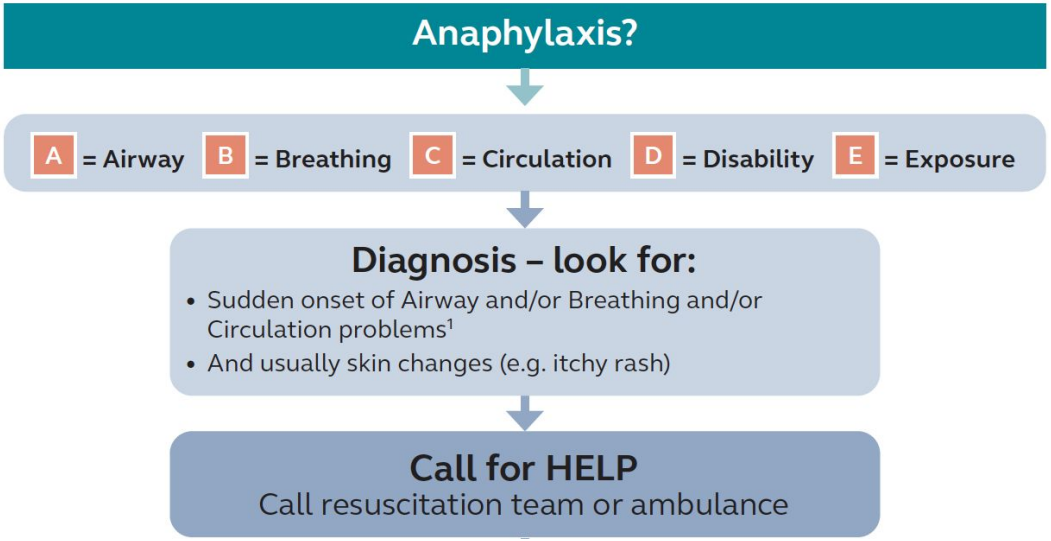
The above doses are for IM injection **only**.
Intravenous adrenaline for anaphylaxis to be given **only by experienced specialists** in an appropriate setting.

3. IV fluid challenge
Use crystalloid

Adults: 500–1000 mL
Children: 10 mL/kg

Resuscitation Council UK

Assess using the ABCDE approach


Anaphylaxis?
A = Airway
B = Breathing
C = Circulation
D = Disability
E = Exposure
Diagnosis – look for:
• Sudden onset of Airway and/or Breathing and/or Circulation problems[1]
• And usually skin changes (e.g. itchy rash)
Call for HELP
Call resuscitation team or ambulance

1. **Life-threatening problems**

Airway
hoarse voice, stridor

Breathing
 work of breathing, wheeze, fatigue, cyanosis, SpO_2 <94%

Circulation
low blood pressure, signs of shock, confusion, reduced consciousness

Resuscitation Council UK

Assess using the ABCDE approach

Disability
• dizziness, decreased conscious level or loss of consciousness

Assess using the ABCDE approach

Exposure
• flushed
• itchy, urticaria or hives
• angioedema

Resuscitation Council UK

Removing trigger and positioning

- Remove trigger if possible (e.g. stop any infusion)
- Lie patient flat (with or without legs elevated)
  - A sitting position may make breathing easier
  - If pregnant, lie on left side

Resuscitation Council UK

Give intramuscular (IM) adrenaline

Use adrenaline at 1 mg/mL (1:1000) concentration

Adult and child > 12 years: 500 micrograms IM (0.5 mL)
Child 6-12 years: 300 micrograms IM (0.3 mL)
Child 6 months to 6 years: 150 micrograms IM (0.15 mL)
Child <6 months: 100-150 micrograms IM (0.1-0.15 mL)

Inject at
anterolateral aspect –
middle third of the thigh

The above doses are for IM injection **Only**

Intravenous adrenaline for anaphylaxis to be given
only by experienced specialists in an appropriate setting

Resuscitation
Council UK

Give intramuscular (IM) adrenaline

- Establish airway
- Give high flow oxygen
- Apply monitoring: pulse oximetry, ECG, blood pressure

If no response:

- Repeat IM adrenaline after 5 minutes
- IV fluid bolus

Resuscitation Council UK

Oxygen and fluids

- oxygen given as soon as available to achieve oxygen saturation of 94-98%

- IV fluids (0.9% sodium chloride or balanced crystalloid)
  - 10 mL kg^{-1} for children
  - 500-1000 mL in adults
  - larger volumes may be needed
  - consider IO route if no IV access

Antihistamines

- **not part of immediate emergency treatment**
- do not delay giving IM adrenaline and fluids
- may be used to treat cutaneous symptoms
- if giving, use a non-sedating oral antihistamine (e.g. cetirizine)

Steroids

- **not part of immediate emergency treatment**
- **give adrenaline and not steroids for anaphylaxis**
- only consider steroids for refractory anaphylaxis with ongoing asthma/shock

Resuscitation Council UK

Bronchodilators

- severe anaphylaxis and life-threatening asthma may present in a similar way
- IM adrenaline is the first drug of choice
- consider bronchodilators (e.g. salbutamol and ipratropium) if there is evidence of bronchospasm
- do not be give bronchodilators as an alternative to further treatment with adrenaline

Refractory Anaphylaxis

- **defined as:**
  - anaphylaxis requiring ongoing treatment (due to persisting respiratory or cardiovascular symptoms) despite 2 appropriate doses of IM adrenaline

- **most patients only need one dose of adrenaline**
- **very few patients need more than 2 doses of adrenaline**

Resuscitation Council UK

GUIDELINES 2021

Refractory anaphylaxis

No improvement in respiratory or cardiovascular symptoms despite 2 appropriate doses of intramuscular adrenaline

Establish dedicated peripheral IV or IO access

Seek expert[1] help early
Critical care support is essential

Give rapid IV fluid bolus
e.g. 0.9% sodium chloride

&

Start adrenaline infusion
Adrenaline is essential for treating all aspects of anaphylaxis

Give IM* adrenaline every 5 minutes until adrenaline infusion has been started
*IV boluses of adrenaline are not recommended, but may be appropriate in some specialist settings (e.g. peri-operative) while an infusion is set up

Give high flow oxygen
Titrate to SpO_2 94–98%

Monitor HR, BP, pulse oximetry and ECG for cardiac arrhythmia
Take blood sample for mast cell tryptase

Follow local protocol

OR

Peripheral low-dose IV adrenaline infusion:

- 1 mg (1 mL of 1 mg/mL [1:1000]) adrenaline in 100 mL of 0.9% sodium chloride
- Prime and connect with an infusion pump via a dedicated line

DO NOT 'piggy back' on to another infusion line

DO NOT infuse on the same side as a BP cuff as this will interfere with the infusion and risk extravasation

- In both adults and children, start at 0.5–1.0 mL/kg/hour, and **titrate according to clinical response**
- Continuous monitoring and observation is mandatory
- ↑↑ BP is likely to indicate adrenaline overdose

Continue adrenaline infusion and treat ABC symptoms

Titrate according to clinical response

[1]Intravenous adrenaline for anaphylaxis to be given only by experienced specialists in an appropriate setting.

A = Airway

Partial upper airway obstruction/stridor:
Nebulised adrenaline (5mL of 1mg/mL)

Total upper airway obstruction:
Expert help needed, follow difficult airway algorithm

B = Breathing

Oxygenation is more important than intubation

If apnoeic:

- Bag mask ventilation
- Consider tracheal intubation

Severe/persistent bronchospasm:

- Nebulised salbutamol and ipratropium with oxygen
- Consider IV bolus and/or infusion of salbutamol or aminophylline
- Inhalational anaesthesia

C = Circulation

Give further fluid boluses and titrate to response:
Child 10 mL/kg per bolus
Adult 500–1000 mL per bolus

- Use glucose-free crystalloid (e.g. Hartmann's Solution, Plasma-Lyte®)

Large volumes may be required (e.g. 3–5 L in adults)

Place arterial cannula for continuous BP monitoring

Establish central venous access

IF REFRACTORY TO ADRENALINE INFUSION
Consider adding a second vasopressor **in addition** to adrenaline infusion:

- Noradrenaline, vasopressin or metaraminol
- In patients on beta-blockers, consider glucagon

Consider extracorporeal life support

Cardiac arrest – follow ALS ALGORITHM

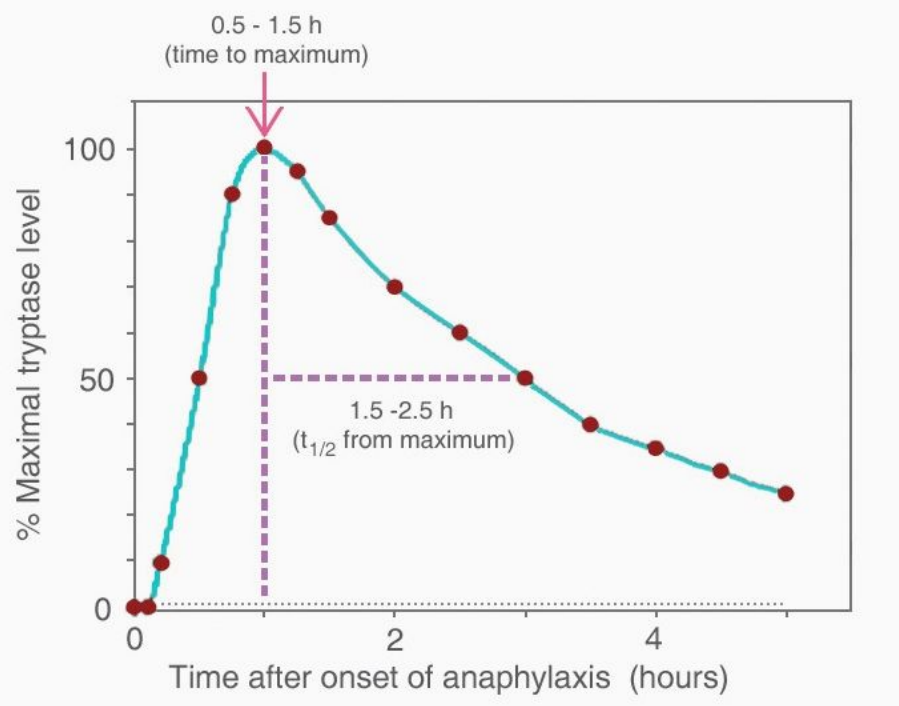
- Start chest compressions early
- Use IV or IO adrenaline bolus (cardiac arrest protocol)
- Aggressive fluid resuscitation
- Consider prolonged resuscitation/extracorporeal CPR

Investigations

- should not delay treatment
- as for a medical emergency:
  - 12-lead ECG
  - Chest x-ray
  - urea and electrolytes
  - blood gases

- **mast cell tryptase**

Mast cell tryptase



- **minimum: one sample** (serum or plasma) within 2 h (when peak tryptase levels generally occur) and no later than 4 h after onset of symptoms

- **ideally: three timed samples**:
  1. as soon as feasible – do not delay treatment to take sample
  2. 1–2 h (but no later than 4 h) after onset of symptoms
  3. at least 24 h after complete resolution, or in convalescence

Resuscitation Council UK

(Schwartz LB. Diagnostic value of tryptase in anaphylaxis and mastocytosis. Immunol Allergy Clin North Am 2006;26(3):451-63)

Discharge and follow-up

Consider fast-track discharge (after 2 hours observation from resolution of anaphylaxis) if:	Minimum 6 hours observation after resolution of symptoms recommended if:	Observation for at least 12 hours following resolution of symptoms if any one of the following:
✓ Good response (within 5–10 minutes) to a single dose of adrenaline given within 30 minutes of onset of reaction **and** ✓ Complete resolution of symptoms **and** ✓ The patient already has unused adrenaline auto-injectors and has been trained how to use them **and** ✓ There is adequate supervision following discharge	✓ 2 doses of IM adrenaline needed to treat reaction* **or** ✓ Previous biphasic reaction	✓ Severe reaction requiring >2 doses of adrenaline. ✓ Patient has severe asthma or reaction involved severe respiratory compromise. ✓ Possibility of continuing absorption of allergen, e.g. slow-release medicines. ✓ Patient presents late at night, or may not be able to respond to any deterioration. ✓ Patients in areas where access to emergency care is difficult.
In all cases, discharge must comply with NICE Clinical Guidance CG134.[96]		

*It may be reasonable for some patients to be discharged after 2 hours despite needing two doses of IM adrenaline, e.g. following a supervised allergy challenge in a specialist setting.

Resuscitation Council UK

Discharge and follow-up

- consider prescribing adrenaline auto-injector to **all** patients with anaphylaxis
- may not be the case if drug-induced anaphylaxis and unlikely to encounter allergen again
- specialist referral
  - refer all patients to an allergy clinic
- patient education
  - prevention, recognition and emergency management/treatment
- reporting
  - anaphylaxis registry www.anaphylaxie.net

Any Questions?

Resuscitation Council UK

Summary

- anaphylaxis poses a serious threat to life
- prompt recognition and treatment is vital
  - ABCDE approach
  - IM adrenaline
  - sit or lie them down
- **most patients respond to 1 dose of IM adrenaline, very few need 2 or more**
- follow the anaphylaxis algorithm
- consider treatment for refractory anaphylaxis
- manage appropriate investigations, discharge and follow-up

Full guideline available at:

www.resus.org.uk/library/additional-guidance/guidance-anaphylaxis

Resuscitation Council UK

Anaphylaxis

All rights reserved
©Resuscitation Council UK (2021)

Resuscitation Council UK